

motion appeared to be from northwest to southeast, and a rumbling noise was reported to have been heard during the shocks. Earthquake shocks were felt in Lake City, Fla., at the same time.

1886, August 31. Earthquake shocks were felt in this city from 8:52 p. m. to 9:03 p. m. The first vibrations were light, but were continuous for a minute and a half, when three or four severe shocks occurred in quick succession, the most violent of which was at 8:53:30 p. m. This building (the Astor Building) vibrated with the shocks and seemed to move from east to west, as the swaying of a railroad train along a straight track, with now and then a sudden lurch, as if the train had turned a sharp curve. The windows, doors, and furniture rattled, and it was difficult for one to stand without support. Distinct earthquake shocks were felt in the city on September 1, at 3:30 a. m. and 3 p. m.; on the 3d, at 10:03 p. m.; 5th, at 10:15 and 10:18 p. m.; 8th, at 12:34 p. m.; 9th, at 12:47 p. m., and on October 22, a shock was felt throughout the city at 4:24 a. m., lasting fifteen seconds, and with energy sufficient to rattle dishes, windows, etc.

The great earthquake shock began in the city of Charleston within a few seconds of 8:51 p. m., ninetieth meridian time, on August 31, 1886.

1893, June 20. An earthquake shock was felt at 10:07 p. m. The duration was about ten seconds and the motion vibratory and continuous, direction northeast to southwest, intensity moderate.

THE UTILIZATION OF MIST, FOG, DEW, AND CLOUD.

In the MONTHLY WEATHER REVIEW, October, 1898, and March, 1899,¹ we suggested methods by which the fog and cloud particles driven by the wind over a region where but little rain falls could be caught and led to the roots of plants and thus made as effective as rain in promoting the growth of useful vegetation. If the large quantity of water that drips from leaves in foggy weather could be quickly conducted to the soil and conserved at a depth of a few inches, it would largely replace the defect of rainfall in a droughty season.

It would seem that the formation of dew also may be intensified and accelerated, so that dew, properly so called, can be led directly to the absorbing rootlets of plants. A dew-pond, however, need not rely wholly upon dew; it may be so constructed that dew, fog-drip, and rain shall all be utilized to maintain the pond. The experiments that have been successful in the moist climate of Great Britain, as explained in the following article by E. A. Martin, are surely worth trying in many portions of the United States.—C. A.

DEW-PONDS.

By EDWARD A. MARTIN, F. G. S.

[Reprinted from Knowledge and Scientific News, May and June, 1907, omitting the illustrations.]

The literature devoted to the subject of dew-ponds is of a very scanty nature, whilst those writers who have dealt with the subject differ considerably amongst themselves as to the principles, if any, on which such ponds are formed, and also, indeed, as to whether the ponds have any right to be called "dew-ponds" at all.

In considering the subject, it is, of course, primarily necessary to recognize clearly how dew is formed, but even in what appears to be such an elementary matter as this there is not a unanimity of opinion. Many meteorologists still maintain the old theory, which is certainly the popular theory, that dew is formed by the precipitation of the aqueous vapour already existing in the lower layers of the atmosphere, when the radiation of heat from the earth has caused its surface to be in the condition to chill below the dew-point the layer of saturated

air in contact with it. Precipitated moisture may appear in the form of dew, hoar-frost, mist, fog, or cloud, but in dew and hoar-frost there is precipitation without a cloudy intermediary. Freest radiation of heat from the earth's surface takes place when there are no clouds to reflect to earth the heat which it gives off at night. If there are no clouds, the chilling of the ground and of the layer of air in contact with it will be considerable, and the temperature may be reduced to the dew-point.

During the last twenty years the acceptance of Dr. J. Aitken's theory has been rapidly growing, that dew is really formed from the moisture which rises out of the soil with the radiation of heat, and that it is this which is precipitated when the air into which it passes has been so reduced in temperature as to be unable to hold it as aqueous vapour. If this theory be the correct one it would at once dispose of the suggestion altogether that dew-ponds are fed and filled by true dew, since the acquisition of dew could only then be obtained at the expense of itself by earlier evaporation.

Messrs. Hubbard, in their "Neolithic Dew-Ponds and Cattle-ways," give some details as to the formation of these ponds, although the source of their information is not stated. They say that there is at least one wandering gang of men, who will construct for the modern farmer a dew-pond which will contain more water in the heat of summer than during the winter rains. The space hollowed out for the purpose is first thickly covered with a coating of dry straw. The straw is in turn covered by well-chosen, finely-puddled clay, and the upper surface of the clay is then closely strewn with stones. The margin of the straw has to be effectually protected by the clay, since if it becomes wet it will cease to attract the dew, as it ceases to act as a nonconductor of heat and "becomes of the same temperature as the surrounding earth." This would, of course, follow quickly if a runnel or spring were allowed to drain into the pond. The puddled clay is chilled by the process of evaporation, and the dry straw prevents the heat of the earth after a hot day from warming the clay.

It is very certain, however, that many alleged dew-ponds are not formed on this plan. This description, it will be observed, clearly presupposes that dew is formed out of the aqueous vapour already existing in the atmosphere, so that if Doctor Aitken's theory is correct, it would seem that a new name is needed to describe water that is precipitated out of the atmosphere in such a case, without the intermediate condition of mist or cloud. Such might be called "invisible mist." Some remarks by G. G. Desmond in the "Nature Notes Column" of the Daily News gave a different arrangement for the basis of the dew-pond. It was there stated that first a bed of concrete is laid down; this is covered with straw, over which is placed another layer of concrete. I have been unable to trace the authority on which this is based.

In a private letter from the maker of some ponds on the "Duke of Norfolk Downs" and on Amberley Mount, it is stated that the highest parts are chosen, as they are "more exposed to the weather" than lower down, the inference being that they are filled by the moisture-laden winds blowing in from the southwest, no consideration being given whatever to any artificial attempt to attract dew-precipitation. But as R. H. Scott says, dew can never appear when there is much wind, for the air can not remain long enough in contact with the soil for any material reduction of its temperature and consequent condensation of moisture to take place. (Int. Sci. Series, Vol. XLVI). The "weather" referred to can only, therefore, be mist or fog.

In 1877 Mr. H. P. Slade discarded the term "dew-ponds" in favour of "artificial rain-ponds," and scouted the idea that dew had any part in filling ponds at all. His remarks dealt practically with one pond, the greatest diameter of which was 69½ feet, which was constructed in 1836 at a cost of £40. It was

¹Vol. xxvi, p. 466; Vol. xxvii, p. 113.